Syllabus
for
MA / MSc Course in Geography & Environment Management

REVISED IN 2016: EFFECTIVE FROM THE ACADEMIC SESSION 2016-2017

Department of Geography and Environment Management
Vidyasagar University
Midnapore
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PIN – 721 102

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DIVISION OF MARKS
Total marks: 1100 (Core) + 100 (Elective)

For Internal Students				Elective
Semesters	**Theoretical**	**Practical**	**Total**	**Total**
Semester- I	200	100	300	-
Semester- II	150	100	250	50
Semester- III	150	100	250	50
Semester- IV	200	100	300	-
Total	**700**	**400**	**1100**	**100**

STRUCTURE OF SYLLABUS

SEMESTER-I
(Duration: July – December)

Type	Paper	Unit	Marks				Credit	Total Class Hours
			End-term Exam.	Internal Exam.	Unit Total	Paper Total		
THEORETICAL	GEO-101	Unit-1: Geotectonics	20	5	25	50	4	60 hours
		Unit-2: Geomorphology	20	5	25			
	GEO-102	Unit-3: Oceanography	20	5	25	50	4	60 hours
		Unit-4: Hydrology	20	5	25			
	GEO -103	Unit-5: Climatology	20	5	25	50	4	60 hours
		Unit-6: Population Geography	20	5	25			
	GEO -104	Unit-7: Basics of Environment and Ecology	20	5	25	50	4	60 hours
		Unit-8: Soil and Agricultural Geography	20	5	25			
PRACTICAL	GEO -105	Unit-9: Hydrological Techniques	25	-	25	50	4	60 hours
		Unit-10:Environmental Mapping	25	-	25			
	GEO -106	Unit-11: Basic Statistics in Geography	25	-	25	50	4	60 hours
		Unit-12: Principles of Remote Sensing and Aerial Photography	25	-	25			

SEMESTER-II
(Duration: January – June)

Type	Course	Unit	Marks				Credit	Total Class Hours
			End-term Exam.	Internal Exam.	Unit Total	Paper Total		
THEORETICAL	GEO -201	Unit- 13: Environmental Engineering	20	5	25	50	4	60 hours
		Unit- 14: Regional Geomorphology of India and West Bengal	20	5	25			
	GEO -202	Unit- 15: Population and Development	20	5	25	50	4	60 hours
		Unit-16: Regional approach in Geography	20	5	25			
	GEO -203	Unit- 17: Concepts in Settlement Geography	20	5	25	50	4	60 hours
		Unit- 18: Political Geography	20	5	25			
	ELECTIVE PAPER (THEORY)							

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	GEO -204	***Unit- 19: Resource and its Management***	**20**	**5**	**25**	**50**	**4**	**60 hours**
		Unit-20: Earth system science	**20**	**5**	**25**			
PRACTICAL	GEO -205	Unit- 21: Computer Basics and Applications	25	-	25	50	4	60 hours
		Unit- 22: Sedimentological Analysis	25	-	25			
	GEO -206	Unit- 23: Physical and Social Thematic Mapping	25	-	25	50	4	60 hours
		Unit-24: Applications of Remote Sensing and Geographic Information System	25	-	25			

SEMESTER- III
(Duration: July – December)

Type	Course	Unit	Marks				Credit	Total Class Hours
			End-term Exam.	Internal Exam.	Unit Total	Paper Total		
THEORETICAL	GEO -301	Unit- 25: Economic Zones and Development Programmes in India	20	5	25	50	4	60 hours
		Unit- 26: Geography of Globalization	20	5	25			
	GEO -302	Unit- 27: Environmental Ethics & Regulation	20	5	25	50	4	60 hours
		Unit- 28: Transport Geography	20	5	25			
	ELECTIVE PAPER (THEORY)							
	GEO -303	***Unit- 29: Emerging Issues and policies on Environment***	**20**	**5**	**25**	**50**	**4**	**60 hours**
		Unit- 30: Environmental Hazards and Disaster Management	**20**	**5**	**25**			
	SPECIAL PAPERS **Option-1: Coastal Management**							
	GEO -304	Unit- 31: Coastal Processes	20	5	25	50	4	60 hours
		Unit-32: Coastal Environments: Focus on Indian Regions	20	5	25			
		Option- 2: Urban Geography & Regional Planning						
		Unit- 31: Foundation of Urban Geography	20	5	25	50	4	60 hours
		Unit- 32: Contemporary Urban Issues	20	5	25			
		Option-3: Remote Sensing and Geographic Information System						
		Unit- 31: Physical Basis of Remote Sensing	20	5	25	50	4	60 hours
		Unit-32: Photogrammetry, Aerial Photo and Satellite System	20	5	25			
PRACTICAL	GEO -305	Unit- 33:Map Transformation and Geodesy	25	-	25	50	4	60 hours
		Unit- 34: Spatial Analysis in Geography	25	-	25			
	GEO -306	Unit- 35: Research Methodology	25	-	25	50	4	60 hours
		Unit- 36: Research Exercise in Geography	25	-	25			

SEMESTER-IV

(Duration: January – June)

Type	Course	Unit	Marks				Credit	Total Class Hours
			End-term Exam.	Internal Exam.	Unit Total	Paper Total		
THEORETICAL	GEO -401	Unit- 37: Schools in Geographical Thought	20	5	25	50	4	60 hours
		Unit- 38: Contemporary Discourses in Geography	20	5	25			
		Unit-39: Land, Water and Forest: Conflict and	20	5	25	50	4	60 hours

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	GEO -402	Conservation						
		Unit- 40: Social and Cultural Geography	20	5	25			
	GEO -403	Unit- 41: Regional Development and Multilevel Planning	20	5	25	50	4	60 hours
		Unit- 42: Landscape Ecology and Planning	20	5	25			
		SPECIAL PAPERS **Option-1: Coastal Management**						
	GEO -404	Unit- 43: Coastal Ecology and Hazards	20	5	25		4	
		Unit- 44: Coastal Issues and Management	20	5	25	50		60 hours
		Option- 2: Urban Geography & Regional Planning						
		Unit- 43: Theoretical Bases of Regional Planning	20	5	25	50	4	60 hours
		Unit-44: Planning for Regional Development	20	5	25			
		Option-3: Remote Sensing and Geographic Information System						
		Unit- 43: Advanced Remote Sensing	20	5	25		4	
		Unit- 44: Advanced GIS and Applications of Remote Sensing	20	5	25	50		60 hours
PRACTICAL	GEO -405	Unit- 45: Advanced Quantitative Methods	25	-	25	50	4	60 hours
		Unit- 46: Geographic Information System	25	-	25			
	GEO -406	Unit- 47: Field Work	25	-	25	50	4	60 hours
		Unit- 48: Field Report	25	-	25			

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SYLLABUS
Semester- I (300 Marks)
THEORETICAL COURSES (200 Marks)

PAPER **GEO-101: GEOTECTONICS AND GEOMORPHOLOGY**
(Marks 50)

Unit-1: GEOTECTONICS

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

1.1 Origin and evolution of Universe with special reference to Stellar evolution.
1.2 Relative and absolute dating: principles and techniques.
1.3 Origin of earth's magnetic field, paleomagnetism, geomagnetic polarity reversal and paleomagnetic timescale, paleomagnetic polar wandering curves and reconstruction of plate tectonic motions.
1.4 Mechanism of plate dynamics. Application of plate tectonic theory in explaining orogenesis, volcanism, earthquake.
1.5 Neo-tectonics and its worldwide evidences.

Unit-2: GEOMORPHOLOGY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

2.1 Concepts in geomorphology: historical and functional approaches, uniformitarianism and catastrophism, base level, grade and profile of equilibrium.
2.2 Weathering: factors, processes and landforms. Mass wasting: safety factor, and resultant landforms.
2.3 Slope Evolution: process-form relationship on slope elements, theories of Wood, Davis, Penck, King, Young and Savigear. Dynamic metastability in slope evolution.
2.4 Fluvial processes and forms: threshold energy for entrainment and transport, channel form and patterns, flood plains, alluvial fan, terraces and delta.
2.5 Applied geomorphology in planning, hydrology and economic geology. Geomorphology in hazard Management (flood, landslide and subsidence).

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PAPER- GEO-102: OCEANOGRAPHY AND HYDROLOGY
(Marks- 50)

Unit- 3: OCEANOGRAPHY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

3.1 Marine Environment and Processes: Major subdivisions of the marine environment, winds and ocean circulation, waves in the ocean, origin of the tides and tidal characteristics.
3.2 Physical and chemical structure of oceans: Water masses and their properties. Sediment in the sea.
3.3 Coastal Habitats: Estuaries, lagoons, salt marshes, mangrove swamps, coral reefs- origin, circulation, sedimentation and ecology.
3.4 The Dynamic Shoreline: Coastal water movement, circulation in the surf zone, beaches, beach profiles, sand budgets, coastal dunes, barrier island, tidal inlets, cliffed coasts, deltas, storm effects. Human impact on the coastline.
3.5 The Ocean's Resources: Law of the sea, law of the sea treaty, exclusive economic zones, mineral resource- oil and natural gas, gas hydrates, sand and gravel, mangrove nodules, cobalt-rich oceanic crusts, phosphate deposits, living resources.

Unit-4: HYDROLOGY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

4.1 Hydrological systems, estimating water potential, water budgeting at watershed level. Hydrologic frequency analysis (Gumbel's equation and log probability law).
4.2 Precipitation estimates: point rainfall analysis, area-depth curve, theissen network and isohyetal method for estimating rainfall volumes.
4.3 Infiltration and evapotranspiration: soil-vegetation complex and infiltration estimates. Methods of estimating evapotranspiration.
4.4 Runoff estimates using curve number, stream discharge estimates by area-velocity method. Ground water: storage structure, flow, recharge and discharge.
4.5 Hydrographs and Rating curve: Time dimensions of hydrographs: concept of unit hydrograph and rating curves and their significance. Flood & Drought as Hydrological Hazards.

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PAPER -GEO-103: CLIMATOLOGY AND POPULATION GEOGRAPHY
(Marks- 50)

Unit-5: CLIMATOLOGY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

5.1 Nature and Scope of Climatology and its relationship with Meteorology, climatological systems operating in different space and timescale: thunderstorm, tropical cyclone and associated hazards, jet Stream, planetary wind systems.

5.2 The General Circulation: GCM, Tropical circulation- mechanism of Indian monsoon, Walker circulation and ENSO phenomena, Temperate Circulation.

5.3 The Climatic Zones of the world with special reference to tropical climates: wet, wet and dry, savanna, desert and highland.

5.4 Sea surface temperature and it's climatic significance; Maritime influence on coastal weather: seasonal changes and storm events.

5.5 Climatic changes through geological periods- evidences and possible causes; Global Warming- Natural and anthropogenic causes and probable consequences.

Unit-6: POPULATION GEOGRAPHY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

6.1 Scope, development and recent trends of population geography and its interdisciplinary nature.

6.2 Population composition and structure: Types, spatial and temporal variation and determinants of age, sex, literacy and rural-urban ratio.

6.3 Demographic Transition: Facts, theories, different waves. Its social, political and economic impacts.

6.4 Population projection: Concept, types and methods.

6.5 Population- resource relationship: Critical analysis of over, under and optimum population, population resource regions, carrying capacity and change in carrying capacity over time. Population policy issues, population equilibrium.

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PAPER-GEO-104: BASICS OF ENVIRONMENT AND ECOLOGY AND AGRICULTURAL GEOGRAPHY
(Marks- 50)

Unit-7: BASICS OF ENVIRONMENT AND ECOLOGY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

7.1 Concept of Environment, major elements of environment, functioning of environmental systems, role of biotic and abiotic elements.
7.2 Ecosystem: structure, function and processes, patterns of energy flow.
7.3 Biogeochemical cycles (Nitrogen, Carbon, Phosphorus), ecosystem metabolism, ecosystem process (photosynthesis and respiration), trophic levels (food web and chain) decomposition, ecosystem stability.
7.4 Terrestrial ecosystems: Forest, Grassland, Desert and Agriculture.
7.5 Biodiversity: Genetic, species, community and ecosystem diversity; biodiversity uses, threats to biodiversity, biodiversity conservation.

Unit-8: SOIL AND AGRICULTURAL GEOGRAPHY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

8.1 Variation in physico-chemical properties of soil with climate and dominance of local factors: organic matter content, pH clay content, clay mineralogy, soil colour, calcium carbonate and soluble salt content.
8.2 Soil Geomorphology: soil landscape analysis in relation to geomorphic surfaces and surface morphometry, catena concept- catena and soil hydrology, slope description and catena, soil catena under different environment, soil morphology and chrono-sequence.
8.3 Approaches in agricultural geography: agricultural systems (ecological or near-ecological systems). Approaches to study agricultural geography, Jonnason's theory on agricultural landuse.
8.4 Determinants of agricultural pattern: physical and institutional, precision farming, use of modern technology.
8.5 Issues and policies in modern Agriculture: Impact of green revolution, GM Crops and agricultural hazards, food security, agricultural policies and their implication.

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PRACTICAL COURSES
(100 Marks)

PAPER GEO-105: HYDROLOGICAL TECHNIQUES AND ENVIRONMENTAL MAPPING
(50 Marks)

Unit-9: HYDROLOGICAL TECHNIQUES

Full Marks- 25
*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

9.1 Point rainfall analysis, area-depth curves, Thiessen network and Isohyetal methods to determine rainfall volumes.
9.2 Estimating infiltration using infiltrometre and other field techniques. Drawing infiltration curve.
9.3 Evaporation estimation: Use of evaporation pan and empirical equations using climatic data.
9.4 Runoff and discharge estimation: Curve Number methods for estimating runoff: area-velocity method for discharge estimate.
9.5 Construction of unit-hydrograph and rating curves.

Unit-10: ENVIRONMENTAL MAPPING
Full Marks- 25
*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

10.1 Estimation and mapping of soil properties: texture, structure, moisture, colour, pH, organic matter, NPK, soil profile mapping.
10.2 Estimation of Water Properties: BOD, COD, Dissolved Oxygen, pH, suspended solid, turbidity and electric conductivity.
10.3 Ecological Micro- zonation Mapping.
10.4 Vegetation density mapping
10.5 Association between soil parameters, vegetation types and density.

PAPER-GEO-106: BASIC STATISTICS IN GEOGRAPHY AND PRINCIPLES OF AERIAL PHOTOGRAPH AND REMOTE SENSING
(Marks- 50)

Unit-11: BASIC STATISTICS IN GEOGRAPHY

Full Marks- 25
*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

11.1 Measurement in Geography: Nominal, ordinal, interval and ratio measurement.

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11.2 Concept of covariance, correlation and regression: Bi-variate analysis - linear, exponential, Product moment correlation, Spearman's Rank correlation, correlation matrix, partial correlation, residuals - mapping of residuals.

11.3 Probability distribution: addition and Law of multiplication, concept of probability distributions (binomial distributions, normal probability distribution), properties of normal curve.

11.4 Hypothesis testing: Formulation, Rejection rule, one and two tailed tests, significance level, degrees of freedom type I and type II errors, Standard Error. Different types of significance test for various purposes. Chi- square test, shortest path analysis, student's t- test.

11.5 Sampling techniques for geographical analysis.

Unit-12: PRINCIPLES OF REMOTE SENSING AND AERIAL PHOTOGRAPHY

Full Marks- 25

*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

12.1 Physics of Remote Sensing: Electro Magnetic Radiation (EMR), Radiation laws (wavelength-frequency-energy relationship of EMR numerical problems).

12.2 Satellite System: Keplers's Laws, Major-Semi-major axis, eccentricity, velocity (Numerical problems).

12.3 Satellite Sensors: Concept of IFOV, resolution and determination of pixel size, referencing scheme of satellite system (path/row calculation).

12.4 Basics of Aerial Photograph: Basics geometry of aerial photograph, determination of scale and height, Distortions, Image parallax, Relief displacement.

12.5 Stereoscopy and Aerial Photo Interpretation: Stereoscopy, Pseudoscopy, Mirror Stereoscope, mosaic, edge information, mapping of Physical and Cultural features with the Air photo interpretation keys: shape, size, pattern, tone, texture, shadow, site and associations.

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SUGGESTED REFERENCES

UNIT-1: Geotectonic

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Cook and Doorncamp. 1988. *Geomorphology in Environment Management*, London

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Summerfield, M.A. (Editor) 1991. *Global Geomorphology : An Introduction to the Study of Landforms*, John Wiley and Sons Ltd., New York: 560p.

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UNIT-2: Geomorphology

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UNIT-3: Oceanography

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UNIT-4: Hydrology

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Singh, V.P. and D.K. Frevest (2006): *Watershed Models*, CRC Press,

Todd, D.K. (2004): *Groundwater Hydrology*, 3re Edition, Wiley, Chichester

UNIT-5: Climatology

Barry, R.G. and Chorley, R.T. (1992): *Atmosphere, Weather and Climate*, 6th edition, Routledge, London: 392p.

Critchfield, H.J. (1983): *General Climatology*, 4th edition, Prentice Hall India Ltd., New Delhi: 453p.

Das, P.K. (1995) : *Monsoons*, 2nd edition, National Book Trust, New Delhi: 347p.

Lal, D.S. (1993) : *Climatology*, 3rd edition, Chaitanya Pub. House, New Delhi: 412p.

Linacre, E. and Geerts, B. (1997): *Climates and Weather Explained*, Routledge, London: 464p.

Lutgens, F.K.. and Tarbuck, E.J. (1998): *The Atmosphere: An Introduction to Meteorology*, 7th edition, Prentice-Hall

Moran, J.M. and Morgan, M.D. (1997) : *Meteorology: The Atmosphere and the Science of Weather*, 5th edition, Prentice-Hall Inc., Upper Saddle River: 530p.

UNIT-6: Population Geography

Binde and Kanitkar (2000): *The Principle of Population Studies*, Himalaya Publication

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Clarke, J.I. (1973): *Population Geography*, Pergamon press, Oxford
Hassan, Mohammad. Izhar, (2005): *Population Geography*, Rawat publication, Jaipur
Hussain, M. (1994): *Human Geography*, Rawat Pub. Co., New Delhi: 485p.
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Premi, M.K.(2006): *Demography and its exposition*, Jwahar Publication, New Delhi
Majumdar, P.K (2010): Fundamentals of Demography, Rawat publication, Jaipur
Mukherji, S. (2013): Migration in India, Rawat publication, Jaipur
Dyson, T. (2010): Population and Development, Rawat publication, Jaipur

UNIT-7 : Basics of Environment and Ecology

Alexander, D. (1993): *Natural Disasters*, Research Press, New Delhi: 619p.
Allaby, M. (1996): *Basics of Environmental Science*, Routledge, London: 297p.
Chapman J.L. and Reiss, M.J. (1993): *Ecology: Principles and Applications*, Cambridge University Press.
Chapman, D. (1994): *Natural Hazards*, Oxford University Press, Melbourne: 174p.
Choudhuri, A.B. (2007): *Endangered Wetland*.
Elsom, D.M. (1992): *Atmospheric Pollution: A Global Problem*, 2nd edn, Blackwell Pub. Co., London: 422p.
Farmer, A. (1997): *Managing Environmental Pollution*, Routledge, London: 246p.
Marsh, W.M. and Grossa, J.M. (1996): *Environmental Geography: Science, Landuse and Earth Systems*, John Wiley & Sons.
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Pickering, K. and Owen, L.A.(1997) : *An Introduction to Global Environmental Issues*, 2nd edition, Routledge, London.
Prabhakar, V.R. (1998): *Social and Community Forestry*, Indian Pub. Distrb., New Delhi: 224p.
Roberts, N. (editor) (1994): *The Changing Global Environment*, 3rd edition, Blackwell Pub. Co., London: 531 p.
Nick Middleton: The Global *casino:an introduction to environmental issues, Arnold* ,A member of the Hodder Headline Group LONDON Distribuced in rhe Uniced Scaces ofAmerim by Oxford University Press Inc., New York.
Robert M. May and Angela R. McLean(2007): Theoretical Ecology:Principles and Applications,Oxford UniversityPress
Barry cox; Peter Dale Moore(2010): Biogeography an ecological and evolutionary approach ,Hoboken, NJ : wiley

UNIT-8: Soil and Agricultural Geography

Bhattacharjee, J.C. (1997): *Introduction to Pedology*, Oxford & IBH.
Biswas, T.D. and Mukherjee, S.K. (1987): *Textbook of Soil Science*, Tata-McGraw-Hill, 314p.
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De, N.K. & Ghosh, P. (1993): *A Study In Soil Geography*, Shribhumi.
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Morgan, R.P.C. (1995): *Soil Erosion and Conservation*, 2nd edition, Longman, London: 198p.
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Agrawal A.N (2005): *Indian agriculture: problems, progress and prospects*, Vani Educational Books New Delhi

UNIT-9: Hydrological Techniques

Bedinent, P.B.et.al. (2008*): Hydrology and Floodplain Management*, Prentice Hall,Upper Saddle River, NJ07458.
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Todd, D.K. (2004): *Groundwater Hydrology*, 3re Edition, Wiley, Chichester

UNIT-10: Environmental Mapping

William J. Sutherland (2006): Ecological Census Techniques Edited by Cambridge 2nd edition
Lagacherie Philippe, McBratney Alex and Voltz Marc(2006) : Digital Soil Mapping :An Introductory Perspective,Elsevier
Scull, P.; J. Franklin, O.A. Chadwick & D. McArthur (June 2003). Predictive soil mapping - a review. Progress in Physical Geography ,Sage Publications.

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UNIT-11: Basic Statistics in Geography

Alvi. Z. (1995*): Statistical Geography: Methods and Applications*, Rawat Publication, New Delhi
John, C. D. (2002): *Statistics and Data Analysis in Geology*; John Wiley & Sons.
Mehmood, A (1977): Statistical methods in Geographical studies, Rajesh Pub. New Delhi
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Swan, A.R.H.; Sandilands, M. and McCabe, P. (1995): *Introduction to Geological Data Analysis*, Blackwell. 446p.
Walford, P. (1995): *Geographical Data Analysis*, John Wiley and Sons Inc., New York: 446p.

Unit-12: Principles of Aerial Photography and Remote Sensing

Allison, L.J., Schnapf, A.(1983): Meteorological satellites: In Colwell, R.N.(ed.) *Manual of Remote Sensing*.
Campbell, J .B. (1996): *Introduction to Remote Sensing*, 2nd edition, Taylor & Francis, London: 622p.
Chaisman, N. (1992): *Exploring Geographical Information Systems*, John Wiley and Sons Inc., New York: 198p.
Colwell, R.N. (ed.) *Manual of Remote Sensing* (2nd edn). American Society of Photogrammetry, Falls Church,
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Rajan, M.S. (1995): *Space today*, 2nd edition, National Book Trust, New Delhi, 344p.
Slater, P.N. (1983*): Photographic systems for remote sensing*, Singapore Science Center.
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Semester- II (300 Marks)

THEORETICAL COURSES (200 Marks)

PAPER- GEO-201: ENVIRONMENTAL ENGINEERING AND REGIONAL GEOMORPHOLOGY OF INDIA & WEST BENGAL
(Marks- 50)

Unit- 13: ENVIRONMENTAL ENGINEERING:

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

13.1. Definition and Domain of Environment Engineering, Waste water treatment: Primary, Secondary and Tertiary treatment; Disposal.
13.2. Sludge treatment; Solid (Municipal) waste management, Hazardous waste management.
13.3. Air pollution; Indoor pollution, Air sampling and measurement, Air pollution control technologies.
13.4. Noise Pollution; Measurement of noise, Biophysical impacts, Mitigation technologies.
13.5. Arsenic Pollution; Spatial distribution, Impacts, Mitigation.

Unit- 14: REGIONAL GEOMORPHOLOGY OF INDIA AND WEST BENGAL

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

14.1 Geomorphology of Darjeeling Himalaya and Terai Region with special reference to landslides and alluvial fans.
14.2 Tectonics, drainage and geomorphology of Western Ghats with special reference to Deccan Trap.
14.3 Geomorphology and soil-landform assemblages of Chhotanagpur Plateau and its adjacent areas of West Bengal, Geomorphology of Rajasthan desert with special reference to Marusthali.
14.4 Form, process and evolution of Ganga, Subarnarekha and Godavari delta.
14.5 Tectonics and Geomorphology of the Islands of Bay of Andaman and Nicobar, Rameswaram and Laksha-Minikoi and Amindivi.

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PAPER GEO-202: POPULATION & DEVELOPMENT AND REGIONAL APPROACH IN GEOGRAPHY
(Marks- 50)

Unit-15: POPULATION & DEVELOPMENT

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

15.1 The fate of Millennium development goals, Human development and gender issues: HDI,GDI, GEM-concept, measures and criticism, disparities
15.2 Population growth: Link to economic development, resource scarcity, food security and sustainable development. Concept of logistic and exponential growth
15.3 Population and development integration with special reference to India
15.4 Theories and approaches of population growth and regulation: Malthus, Marx and Neo-Malthusiasm
15.5 Migration: Concept of social mobility, concept, types, patterns, theories (Ravenstein, Lee, Louis and Zelinsky), consequences.

Unit- 16: REGIONAL APPROACH IN GEOGRAPHY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

16.1 Regional concept in geography: concept, typology, hierarchy, methods of regional delineation and regional system
16.2 Contribution of Ratzel, Hartshorne, Schaefer and Vidal de la Blache to the development of regional concept. The character of regional geography, Space: the fundamental stuff of geography (Geography in history or historical geography
16.3 Formal regions: Natural, Agro-climatic, socio-cultural regions with special reference to India
16.4 Functional region: City region, industrial region with special reference to India
16.5 Planning regions in India: Conceptual framework, purpose, types and delineation, planning of problem regions: Tribal, coastal, drought prone area, flood prone area.

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PAPER GEO- 203: CONEPTS IN SETTLEMENT GEOGRAPHY AND POLITICAL GEOGRAPHY
(Marks- 50)

Unit- 17: CONEPTS IN SETTLEMENT GEOGRAPHY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

17.1 Concept of shelter; Dwelling places as cultural expression
17.2 Census categories of settlements; Types, building materials and architectural design of houses- dependence on climate.
17.3 Site, situation and spacing of settlements- dependence on terrain characteristics and water availability. .
17.4 Concepts and components of rural and urban morphology.
17.5 Socio-economic segregation of rural settlements. Cities as melting pot of culture.

Unit- 18: POLITICAL GEOGRAPHY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

18.1 Politics and Geography: Politics of Space, Scope of electoral geography, Global strategic views- Heartland and Rimland theories and their significance in present international politics.
18.2 Geopolitical significance of core-periphery theory; Nationalism and Regionalism.
18.3 Geography and federalism; Reorganization of Indian states since independence, Partition of India and its consequences
18.4. International and interstate water disputes in India.
18.5. Political and economic blocs; Geopolitics in the context of globalization, colonialism and post colonialism.

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ELECTIVE PAPERS

PAPER- GEO-204: RESOURCE AND ITS MANAGEMENT AND EARTH SYSTEM SCIENCE

(Marks- 50)

Unit- 19: RESOURCE AND ITS MANAGEMENT

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

19.1 Geography as a science of synthesis; social relevance of geography
19.2 Resource assessments, management and mapping
19.3 Human resource development in backward region.
19.4 Indicators of livelihood security.
19.5 Microlevel resource planning in watershed scale.

Unit-20: EARTH SYSTEM SCIENCE

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

20.1 Earth surface processes and Geo-tectonics
20.2 Composition of atmosphere and atmospheric processes
20.3 Bottom relief of major oceans; temperature and salinity distribution
20.4 Principles of mapping and applications
20.5 Regional geomorphology of West Bengal.

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PRACTICAL COURSES (100 Marks)

COURSE NO. GEO-205: COMPUTER BASICS & APPLICATIONS AND SEDIMENTOLOGICAL ANALYSIS (Marks-50)

Unit- 21: COMPUTER BASICS AND APPLICATIONS

Full Marks- 25
*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

21.1 Computer components: Hardware and software: CPU, Input and Output devices; Common computer languages, System Software, Application Software and Operating Systems.
21.2 Representation of data; Numbering Systems; Binary Arithmetic; Basic Logic Gates; Boolean Logic and Reduction Techniques.
21.3 Computation, Storing and Formatting Spreadsheets: Computation of Rank, Mean, Median, Mode, Standard Deviation, Moving Averages, Sample Variation; Derivation of Correlation, Covariance and regression; Selection of technique and interpretation using MS-Excel and SPSS Environment.
21.4 Regression, correlation, curve fitting, multivariate analysis.
22.5 Internet Surfing- generations of data and extraction of information for power-point presentation, Manipulation and editing of graphic files.

Unit- 22: SEDIMENTOLOGICAL ANALYSIS

*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

22.1 Phi-scale of grain size distribution, texture analysis of sediment samples using standard techniques, statistical representation.
22.2 Form and shape analysis of pebble grade sediments.
22.3 Megascopic and microscopic examination of sediments.
22.4 Identification of sedimentary and bioturbation structures.
22.5 Sedimentary environmental facies analysis.

PAPER-GEO-206: PHYSICAL & SOCIAL THEMATIC MAPPING AND APPLICATIONS OF REMOTE SENSING & GEOGRAPHIC INFORMATION SYSTEM (Marks- 50)

Unit- 23: PHYSICAL AND SOCIAL THEMATIC MAPPING

Full Marks- 25
*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

23.1 Morphometry and Drainage Network Analysis of watershed.
23.2 Mapping of farming practices: Crop-combination, diversification and cropping intensity.
23.3 Mapping of social vulnerability and social disparities, ethnic mapping.

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23.4 Estimation and Mapping of Social Well-being, HDI, GDI, GEM.
23.5 Estimation of Human Poverty Index –(HPI-I and II) for developed and developing countries.

Unit-24: APPLICATIONS OF REMOTE SENSING &GEOGRAPHIC INFORMATION SYSTEM

Full Marks- 25
*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

24.1 Geo-referencing of maps and satellite images.
24.2 Preparation of different types of FCC. Image enhancement, Band rationing, Density slicing.
24.3 Supervised and Unsupervised Classification Techniques, generation of signature statistics and signature reparability reports.Generation of NDVI.
24.4 GIS: RS, GIS and GNSS.
24.5 Map layers: Overlay analysis, buffering and map composition

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SUGGESTED REFERENCES

UNIT-13: Environmental Engineering

Brady,N.C. and Well, R.R. (2005): *The Nature and Properties of Soil*, Pearson Education, Singapore.

Masters, G .M. (1991): *Introduction to Environmental Engineering and Sciences*, Prentice Hall India Ltd. New Delhi:

Nazaroff, W.W. and Alvarej, C.L. (2001*): Environment Engineering Science*; John Wiley & Sons, Newyork.

Pielou, E.C. (1975): *Ecological Diversity*, John Wiley & Sons, Newyork

Schwab,G.O. et.al. (1993): *Soil and Water Conservation Engineering*, 4th Edition, John Wiley & Sons, Newyork

Sing,V.P. Yavada,R.N.(2003): *Environmental Pollution*, Allied Publishers Pvt. Ltd. New Delhi.

Vesilind, P.A. and Morgan, S.M. (2004): *Introduction to Environmental Engineering* (2nd Edition), Thomson, Australia.

UNIT-14: Regional Geomorphology of India and West Bengal

Ahmad, Enayat. (1972): *Coastal geomorphology of India*; Orient Longman.

Biswas, A. (1987): *Laterites and lateritoids, Explorations in the tropics*: V.S. Datye et. al., Prof. K.R.Dikshit felicitation Committee, Pune, PP.137-140.

Mukhopadhyay, S.C: *Geomorphology Of The Subarnarekha Basin: The Chota Nagpur Plateau (eastern India*, the University of Burdwan,

Rawat, T. (2008*): Environment of the Himalayas*, Eastern Book Corporation

Sehgal, J and Blum, W.E et al. (1998): *Red and Lateritic Soils*, Oxford and IBH pub.

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Sharma, H. S. (1991): *Indian Geomorphology*, Concept Publishing Company.

Starkel, L. and Basu, S. 2000 *Rains, Landslides and Floods in the Darjeeling Himalaya*, Indian National Science academy, New Delhi: 168p.

UNIT-15: Population and Development

Deshpande, Ashwini. (2007): *Globalization and Development: A Handbook Of New Perspectives*; Oxford University Press, N Delhi.

Dreze, Jeaw and Sen, A. (2002): *India: Development and Participation*, Oxford University Press

Gould, W. T. S. (2009): *Population and Development* (Series - Routledge Perspectives on Development); Taylor & Francis.

Nag, Prithvish; Kumar, Chandra Shekhar and Sengupta, Smita. (2001): *Environment, Population and Development*; Concept Publishing Company.

Ranjan, Alok. (1999): *Population And Development: The Indian Perspective*; Universal Publishers.

Shandilya, T. K. (1995): *Population Problem and Development*; Deep & Deep Publications.

Srivastava, A. K. (2004*): Population Development, Environment and Health*; Aph Publishing Corporations.

Sroaff, Meera. (2004): *Population and Sustainable Development*; Adhyayan Publishers and Distributors.

Youngs, G (2001); Globalization, Communication and Technology, Cambridge

Parr-S,F and Kumar, A.K (2005): Readings in Human Development, Oxford University Press, New Delhi

Morris, a (1998):Geography and Development, University College London Press, London

UNIT-16: Regional Approach in Geography

Bhat, L.S. (1973): *Regional Planning in India*, Statistical Pub. Society.

Chand, M. and Puri, V.K. (1988): *Regional Planning in India*, Vikas, New Delhi .

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Chandana, R.C.(2000): *Regional Planning and Development*, Kalyani Publishers.
Glasson, J. (1974): *An Introduction to Regional Planning*, Hutchinson, London.
Greed (2000): *Introducing Planning*, Athlone Press, London.
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Mitra, A. (1971): L*evels of Regional Development India*, Census of India.
Tim, Hall (2006): *Urban Geography*, Routledge.

UNIT-17: Concepts in Settlement Geography

Brian,K.R(1996):*Landscapes of Settlements:Prehistory to the Present,* Routledge,London
De Blij H.J. (1995): *The Earth: An Introduction to its Physical and Human Geography*, John Wiley and Sons Inc., New
De Blij H.J. (1996): *Human Geography: Culture, Society and Space*, John Wiley and Sons Inc., New York: 531 p.
Ghosh, S. (1998): *Introduction to Settlement Geography*, Orient Longman Ltd., Calcutta: 158p.
Hudson, F.S. (1970): *Geography of Settlements*, Macdonald and Evans Ltd., Plymouth
Hussain, M. (1994): *Human Geography*, Rawat Pub. Co., New Delhi: 485p.
Misra. H.N. (ed) (1987): *Contributions to Indian Geography*, Volume 9: *Rural Geography*, Heritage Pub., New Delhi.
Racine, J. (ed) : *Calcutta 1981*, Concept Pub. Co., New Delhi.
Rodwin (2006): *Shelter, Settlement and Development*, Rawat Pub.
Singh, R. Y. (1994) : *Geography of Settlements*, Rawat Pub. Co., New Delhi: 335p.
Singh, R.L. et. al. (ed) (1976): *Geographic Dimensions of Rural Settlements*, National Geographical Society of India, Varanasi.
Ramachandram, R. (1999): Urbanization and urban systems in India, Oxford University Press, New Delhi
Verma, L (2009): Urban Geography, Rawat publication, Jaipur
Roy Chaudhuri, J. (2001): An Introduction to Development and Regional Planning-with special reference to India, Orient Blackshawn, Hyderaband

UNIT-18: Political Geography

Adhirari, S. (2004): *Political Geography*, Rawat Pub. Jaipur.
Alexander, L.M.(1963): *The World Political Pattern*, Rand Mcnally, Chicago.
Alland, A. (1972*): The Human Imperatives*, Atheneum, New York.
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Dikshit R. D. (1975): *Political Geography, - A contemporary perspective*, Tata McGraw Hill Pub. Company, New Delhi
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Goblet, Y.M. (1955): *Political Geography and the World Map*, George Philip and sons Ltd.
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Jackson, WAD (1964): *Politics and Geographic Relationship*, PrenticeHall.
Taylor, P.J.(1985): *Political Geography, World Economy, Nation, State & Locality*, Longman, Landon.
Weigest, H. (1957): *Principles of Political Geography*, Appleton century, Crasts Inc. New york.

UNIT-19: Resource and its Management

A. P. Subudhi, B. S. Sokhi, Dr. P. S. Roy (2001): *Remote Sensing and GIS: Application in Urban and* , Government of India, – Urbanization
Chris Rowley (2012): Human *Resource Management in the Asia-Pacific Region: Convergence Revisited*, Routledge.
Christian M. Stracke (2011): Competence Modelling for Human Resources Development and European Policies: Bridging Business, Education and Training; E-competences Tools, GITO mbh Verlag,

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Daniel Maxwell (2000): *Urban Livelihoods and Food and Nutrition Security in Greater Accra, Ghana*, Intl Food Policy Res Inst, - Health & Fitness
Deep Ford, Crescenzo Dell'Aquila, Piero Conforti (2007): *Agricultural Trade Policy and Food Security in the Caribbean: Structural Issues, Multilateral Negotiations and Competitiveness*, Food & Agriculture Org., - Business & Economics
Eric Craswell, Mike Bonnell, Deborah Bossio, Siegfried Demuth, Nick van de Giesen (2007): *Integrated Assessment of Water Resources and Global Change*: *A North-South Analysis*, Springer Science & Business Media,
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Isobel W. Heathcote (2009): *Integrated Watershed Management: Principles and Practice*, John Wiley & Sons, - Business & Economics
K. V. Sundaram, M. Moni, Mrityunjay M. Jha (2004): *Natural Resources Management and Livelihood Security: Survival Strategies and Sustainable Policies*, Concept Publishing Company, - Sustainable agriculture
Long-term Strategy for Human Resources Development: Food, Agriculture and Natural Resources by Southern African Centre for Cooperation in Agricultural and Natural Resources Research and Training, 1997
Lorraine Corner: *Poverty alleviation and human resources development*
Maiti, R.K.(2016): *Modern Approaches to Fluvial Geomorphology*, Primus Books, New Delhi, 221p.
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Michael Zanko (2002): *The Handbook of Human Resource Management Policies and Practices in Asia-Pacific Economies*, (Volume 1), Edward Elgar Publishing.
Murthy, K.S. (1998): *Watershed Management in India*, 3rd edition, Wiely Eastern Ltd. / New Age International Ltd., New Delhi: 198p
Prashant K Srivastava, Saumitra Mukherjee, Manika Gupta, Tanvir Islam (2011): *Remote Sensing Applications in Environmental Research*, Springer.
Rob F. Poell, Tonette S. Rocco, Gene L. Roth (2014): *The Routledge Companion to Human Resource Development*, Routledge.
S. Sankar, P. C. Anil, M. Amruth (2000): *Criteria and Indicators for Sustainable Plantation Forestry in India*, CIFOR, – Eucalyptus
Thomas N. Garavan, Alma M. Mccarthy, Michael J. Morley (2016): *Global Human Resource Development: Regional and Country Perspectives*, Routledge.
Vijay P. Singh, Ram Narayan Yadava (2003): *Watershed Management*, Allied Publishers.

U N I T - 2 0 : Earth system science

Boaden (et al.) (1982): *Introduction to Coastal Ecology*, Blackie.
Chicago Levinton, J.S. (1982): *Marine Ecology*, PrenticeHall.
Garrison, T.S. (2007): *Oceanography: An Introduction to Marine Science*, 6thEdition, BrooksCole,
K S Valdiya, (2010), *The Making of India Geodynamic Evolution* by, Macmillan
Maiti, R.K.(2016): *Modern Approaches to Fluvial Geomorphology*, Primus Books, New Delhi, 221p.
P S Chakraborti and Snjai Nag (2016*), Rivers of West Bengal : Changing scenario*, Kolkata, 225p.
Paul Ashis kr. (2002), *Coastal Geomorphology and Environment*, ACB Publications, Kolkata, 582p
Pinet, Paul. (2006*): Invitation to Oceanography*, Jones & Bartlett.
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Nag, P and Dutta, G.K (1992): *Thematic Cartography and Remote Sensing*, Concept
Wilford, J,N (2000): *The Map Makers*, A.A. Knopf

UNIT-21: Computer Basics and Application

Bartee, Thomas C. (1977): Digital Computer Fundamental; McGraw Hill.
Blissmer (1996): *Working with MS Word*; Houghton Mifflin Co.
Chauhan, S.; Chauhan, A. and Gupta, K. (2006): *Fundamental of Computer*; Firewall Media.
Flake, L.J.; McClintock, C.E. and Turner, S. (1989): Fundamental of Computer Education; Wordsworth Pub. Co.
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Leon, A .and Leon,M.(1999): Introduction to Computer, USB Publishers' Distributors Ltd.
Leon, A. and Leon, M.(1999): A beginners Guide to Computers, lean Vikas
Malvino, A.P. and Leach, D.P. (1981): Digital Principles and Appications; Tata McGraw Hill.
Mano, Moris M. and Kime, Charles R. (2004): *Logic and Computer Design Fundamental*; Prentice Hall.
Rajaraman, V. (2003): Fundamentals of Computer, Prentice Hall Publisher
Rajaraman, V. (2008): Computer Primer; Prentice Hall of India Pvt. Ltd.
Sarkar, A. and Gupta, S.K (2002) Elements of computer Science, S Chand and Company, New Delhi
Shepard, Aaron (2007): *Perfect Pages*; Shepard Publications.
Tyson, Herbert L. (2007): Microsoft Word 2007 bible; John Wiley.
Walkenbach, John (2007): Excel 2007 Bible; John Wiley.

UNIT-22: Sedimentological Analysis

Maclane, M (1995): Sedimentology, Oxford University Press, New York, Oxford.
Folk, L. Robert (1978): Petrology of sedimentary rocks, Hemphill Publishing Company, Austin, Texas.
Collinson, J.D and Thompson, D.B. (1989): Sedimentary structures, CBS Publishers and Distributors, New Delhi.
Miall, A.D. (2006): Geology of the fluvial deposits: Sedimentary facies, basin analysis and petroleum geology, Springer.
Reading, H.G. (1996) Sedimentary environments: Processes, Facies and Stratigraphy, Blackwell Science.
Sengupta, S (1994): Introduction to sedimentology, Oxford and IBH Publishing New Delhi
Lindholm Roy C. (1986): A practical approach to sedimentology, C B S Publishers and Distributors New Delhi

UNIT-23: Physical and Social Thematic Mapping

Basu, R. and Bhaduri, S. (2007): Contemporary Issues and Techniques in Geography, Progressive Pub.
Dent., D.B (1993): *Cartography: Thematic map design*, Sea Brown Publishers
Misra, R.P and Ramesh, A (1989): *Fundamental of Cartography*, Concept, Delhi
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Nag, P and Dutta, G.K (1992): *Thematic Cartography and Remote Sensing*, Concept
:
Wilford, J,N (2000): *The Map Makers*, A.A. Knopf

UNIT-24: Application of Remote Sensing In Geography

Allison, L.J., Schnapf, A.(1983): *Meteorological satellites*: In Colwell, R.N.(ed.) Manual of Remote Sensing (2nd edn).
Avery,T.E.,and G.L.Berlin, (1992): *Fundamental of remote sensing and air photo interpretation*,5th ed, Macmillan, New York,
Billingsley, F.C. (1983): *Data Processing and Reprocessing*: In Colwell, R.N.(ed.) Manual of Remote Sensing (2nd edn).

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Campbell, J .B. (1996): *Introduction to Remote Sensing*, 2nd edition, Taylor & Francis, London: 622p.

Canada Center for Remote Sensing, *Remote Sensing Tutorial*

Cracknelll, A.P., and L.W.B.Hayes, (1991): *Introduction to Remote Sensing*, Taylor and Francis, Washington.

Curran, P.J. (1980): *Mlltispectral remote sensing of vegetation amount*, Progress in Physical Geography

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Joseph, George, (2003): *Fundamental of Remote Sensing*, University Press (India) Pvt. Ltd, Orient Longman Pvt. Ltd., Hyderabad, India

Lillesand, T.M. and Kieffer, R.W., 2003. Remote Sensing and Image Interpretation, 5th Edition. Wiley, NY.

Marcolongo, B. And Mantorani, F. (1997): *Photogeology: Remote Sensing Application in Earth Science*, Oxford and IBH Pub. Pvt. Ltd., New Delhi: 195p.

Rajan, M.S. (1995): *Space today*, 2nd edition, National Book Trust, New Delhi, 344p.

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Semester- III (300 Marks)

THEORETICAL COURSES (200 Marks)

COURSE NO. GEO-301: ECONOMIC ZONES & DEVELOPMENT PROGRAMMES IN INDIA AND GEOGRAPHY OF GLOBALIZATION

(Marks- 50)

Unit- 25: ECONOMIC ZONES AND DEVELOPMENT PROGRAMMES IN INDIA

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

25.1 Concepts of Special Economic Zone (SEZ), Exclusive Economic Zone (EEZ), Export Processing Zone (EPZ), industrial complex and industrial hub.
25.2 Development Programmes: Rural and urban poverty alleviation programmes- National Rural Employment Guarantee Act, Jawahar Rozgar Yojana, Sampoorna Grameen Rozgar Yojana, Jawaharlal Nehru National Urban Renewal Mission; Infrastructural development programmes- Indira Avas Yojana.
25.3 Transport Development: Golden Quadrilateral, Pradhan Mantri Gram Sadak Yojana, National Freight Corridor. Bharat Nirman Programmes.
25.4 Emerging Industries: Food Processing, Information Technology, Tourism, Gems and Jewellery industry.
25.5 Relative Importance of Tertiary, Quaternary, Quinery activities.

Unit- 26: GEOGRAPHY OF GLOBALIZATION

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

26.1. Transformed Geography: Concept of Liberalization, Privatization and Globalization (LPG), rise of the globalization, conflicts of globalization, concept of glocalilisation.
26.2. Globalization and Economic Geography: Economic geography in the era of Globalization; changes and recent trends, Impact of globalization on agriculture, industry and trade.
26.3 World economic order: Economic booms and crisis.
26.4. Globalization and cultural changes: Globalization and cultural transformations.
26.5. Assessing the future of globalization and global challenges: Inequality, development and globalization, environment, sustainability and globalization.

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PAPER-GEO- 302: ENVIRONMENTAL ETHICS AND REGULATIONS AND TRANSPORT GEOGRAPHY
(Marks- 50)

Unit-27: ENVIRONMENTAL ETHICS AND REGULATIONS

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

27.1 Environmental ethics and education; Concept and development of environmental philosophy, Ecocentrism and Anthropocentrism, the land ethic (Aldo Leopold), Gaia concept, Eco-feminism. Formal and non-formal environmental education, Tbilisi conference, environmental awareness.
27.2 Ethics, culture and conservation of environment: Landscape ecology and ethno-ecology, environmental stewardship.
27.3 Environmental Impact Assessment (EIA), Environmental Management Planning (EMP), Environmental Performance Assessment (EPA).
27.4 Global Environmental Issues: Stockholm Conference, the Earth Summits, Inter-Governmental Panel for Climate Change (IPCC).
27.5 Environmental Laws in India: Wild life Act, Forest Acts, Environmental Protection Act, National Environmental Tribunal Act.

Unit- 28: TRANSPORT GEOGRAPHY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

28.1 Concept of distance, Transportation and space, space-time relation through transportation, Transport network analysis, Centrality, Accessibility, Connectivity and Rationality. Transport Models (Gravity Models, Allocation Model, Linear Programming Model, Traffic Congestion Model).
28.2 Transport cost, Principles of transport cost fixation, comparative cost advantage.
28.3 Planning for public transport, desired characteristics, modes and optimal pricing, services, ownership and regulation.
28.4 Transport Policy: Problem oriented planning, and objective-led approach; Infrastructure, Management, Information, Pricing and landuse components; National transport policy (national highways, railways and waterways).
28.5 Communication Technology- roles in reducing transport demand.

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ELECTIVE PAPER

PAPER- GEO-303: EMERGING ISSUES AND POLICIES ON ENVIRONMENT AND ENVIRONMENTAL HAZARDS AND DISASTER MANAGEMENT

(Marks-50)

Unit- 29: Emerging Issues and Policies on Environment

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

29.1 Global climate change, water scarcity and politics of water
29.2 Environmental degradation and pollution
29.3 Environment and development: Debate and Issues
29.4 Social and Cultural Hazards
29.5 Globalization and Environment

Unit- 30: Environmental Hazards and Disaster Management

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

30.1 Concepts and techniques for analysis of risk, hazard, disaster, vulnerabilities and resilience.
30.2 Cyclone and storm surges, thunderstorms and lighting, earthquake, tsunami wave and landslide hazards.
30.3 Natural hazard and disaster management in India, Agricultural drought hazard and the national experience
30.4 International Disaster Response Laws Rules (IDRL)
30.5 National policy and appraisal of hazard

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PAPER- GEO- 304: SPECIAL PAPERS (Marks- 50)
(Option-1: COASTAL MANAGEMENT)

Unit- 31: COASTAL PROCESSES

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

31.1 Definition of coastal zone, relevance of coastal study, classification of coast - Beach stage model.
31.2 Wave hydrodynamics; wave modification near coast with special reference to attenuation, breaker types, energy dissipation during breaking wave.
31.3 Tide; diurnal and semi-diurnal, rotating and progressive tide, concept of live storage, tidal environment with special reference to estuary.
31.4 Coastal current; intensity of long shore component and its implications, cell circulation.
31.5 Macro land forms with special reference to beaches and dunes; micro and biogenic forms.

Unit- 32: COASTAL ENVIRONMENTS: FOCUS ON INDIAN REGIONS

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

32.1 Tide dominated coastal environment: (Estuaries of India, estuary morphology, estuary hydrolodynamics); wave dominated coastal environments: (The shore face, beaches, barriers and human activity)- Indian experiences.
32.2 Morphodynamic behavior of coastal systems (Modification of coastal features in temporal and spatial scales with feedback mechanisms).
32.3 Carbonate platforms and beach rocks (Andaman and Nicobar Islands).
32.4 Coastal erosion problems (West Bengal, Orissa coasts), land reclamations and associated problems (Sundarban coastal tract)
32.5 Techniques for assessing coastal hazards areas (Hazard zonation along the coasts).

(Option-2: URBAN GEOGRAPHY AND REGIONAL PLANNING)

Unit- 31: FOUNDATION OF URBAN GEOGRAPHY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

31.1 Development of urban geography as a systematic discipline: Scope, content and recent trends.

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31.2 Concept and definitions of urban system: Urban, urbanization, urbanism and urban ecology, National urban system and global economy: nature of urban system, global economy and global shift.
31.3 Today's cities and suburbs: suburban sprawl, smart growth, exurbs, the new cities and gated communities
31.4 Origin and growth of urban living: bases and processes, Historical perspectives on world urbanization
31.5 Urban planning, policies and regeneration: Architectural vision, European, Anglo American tradition and planning the social city, the new towns movement, toward planning for sustainable urban development.

Unit- 32: CONTEMPORARY URBAN ISSUES

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

32.1 Changing spatial and temporal scenario of metropolitan development in India.
32.2 The economy of urban areas: structure of urban economy (basic and non-basic), urban change within global economy (TNC, MNC, new production systems, deindustrialization and tertianization).
32.3 Urban sociology and urban life: classic and modern statements (Karl Marx, E. Durkheim, Max Weber, Robert Park and Louis Wirth), Classical theories: Tolerance and impersonality in the city, urban pathology and urban malaise
32.4 Social environment of the city: Social stratification, social class diversity, suburban social class, poverty, strangers, crowding, crime and homelessness.
32.5 Urban environment problems: Heat island, drainage, sewerage, sanitation, transport, congestion, pollution and health, the city's ecological footprint, Urban Livability Index. Application of Remote Sensing and GIS in urban planning and management.

(Option-3: REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM)

Unit- 31: PHYSICAL BASIS OF REMOTE SENSING

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

31.1 Physics of Remote Sensing: Source of Energy, Electro Magnetic Radiation (EMR), Radiation laws (wavelength-frequency-energy relationship of EMR), influence of atmosphere on Remote Sensing operation.
31.2 Fundamental of Thermal Remote Sensing: Radiant temperature, Kinetic temperature, Black body and real body radiation.
31.3 Satellite orbits and Trajectories: Principles of satellite movements, orbits and trajectory, orbiting satellites-basic principles, orbital parameters, types of satellites.

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31.4 Satellite Platforms and Sensors: Types of platform for civilian applications, advantages, disadvantages and characteristics of various satellite platforms. Physical principles and characteristics of various satellites sensor, sensor selection parameters, resolution.

31.5 Remote Sensing Data: Data acquisition and reception, Data products, storage and Dissemination.

Unit- 32: PHOTOGRAMMETRY, AERIAL PHOTO AND SATELLITE SYSTEM

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

32.1 Basics of Aerial Photograph: Types of aerial photographs, Geometry of single Aerial Photograph, Photographic overlap, flight planning, Scale, Lens Distortions, Relief distortions and Tilt distortions. Image displacement and parallax.

32.2 Aerial Photographic Film: Film density and Characteristics Curve, Colour Infrared Films, Film resolution, Filters.

32.3 Photogrammetry: Development of Photogrammetry, Classification, processes and Limitations of photogrammetry.

32.4 Stereo photogrammetry: Conditions for Stereo vision, stereoscopic measurements, Sterescopic 3D viewing, Image parallax, Rectification, Orthorectification.

32.5 Satellite Systems: Whiskbroom system, Pushbroom system, Microwave system, coarse resolution, fine resolution and very fine resolution system.

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PRACTICAL COURSES (100 Marks)

PAPER-GEO-305: MAP TRANSFORMATION & GEODESY AND SPATIAL ANALYSIS IN GEOGRAPHY
(Marks-50)

Unit- 33: MAP TRANSFORMATION AND GEODESY

Full Marks- 25
*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

33.1 Map transformation: Scale factor; distortion types; systems of map projections; principles of choosing map projection; importance of map projection in GIS.
33.2 Principle, construction, properties and uses of following map projections:
a) Conformal Projections- Mercator's Projection; Transverse Mercator Projection and Lambert's Conformal Conic (LCC) Projection.
33.3 Principle, construction, properties and uses of following map projections
b) Equal Area Projection- Mollweide's Projection.
c) Conical Projection- Simple Conical Projection with Two Standard Parallels.
33.4 Geodesy: Scope and application; concept of Geoid, reference ellipsoid and spheroid- WGS 84, Everest Spheroid.
33.5 Coordinate Systems: Cartesian, Rectangular, Spherical, Curvilinear, Spherical, UTM Grid System.

Unit- 34: SPATIAL ANALYSIS IN GEOGRAPHY

Full Marks- 25
*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

34.1 Transport network analysis: Centrality Indices, Shortest path analysis(Transport and allocation problems), Detour and spread.
34.2 Distance Matrix (Aggregate Travel Distance).
34.3 Point spatial distribution analysis: Uniformity, randomness and compactness.
34.4 Analysis of Directional Data; Rose diagram, Dominant Direction, Mean direction.
34.5 Analysis of Shape: Measures based on axial ratios, perimeters to areas, areas to axial length.

PAPER- GEO-306: RESEARCH METHODOLOGY AND RESEARCH EXERCISE IN GEOGRAPHY
(Marks- 50)

Unit- 35: RESEARCH METHODOLOGY

Full Marks- 25
*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

35.1 Research ethics and paradigm shift of research methodology in Geography

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35.2 Need for research, basic research types

35.3 Identification of research problems, development of theoretical background- literature review, research gap and research question and specification of the objectives of study; hypothesis building, Framework of research writing.

35.4 Methods of data collection- primary and secondary; Preparation of questionnaire and survey schedule and their differences, research ethics.

35.5 Methods of writing notes, style of referencing, bibliography and appendices, abstract and synopsis writing.

Unit- 36: RESEARCH EXERCISE IN GEOGRAPHY

Full Marks- 25 (Evaluation of written report-10 and Viva-voce based on Power point presentation- 15)

Field work on a specific environmental issue and generation of report (within about 50 A4 size pages including 15-20 maps/diagrams/field photographs).

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UNIT-25: Economic Zones and Development Programmes in India

Churchel, R. R. and Lowe, A.D (1999): *The Law of the Sea*, Manchester University Press
Doshi, K (2007*): Treaties on Special Economic Zone*, Snow White Publication
Dutt, R. and Sundaram.K.P.M . (2007*): Indian Ecocomy*, S. Chand and Com Ltd, Ramnagar, New Delhi
Gupta, K.R (2008): *Special Economic Zones: Issues, Law and Procedure*, Atlantic Publisher
Nilekani, Nandan (2009): *Imagining India- The Idea of a Renewed Nation*, Penguin Press
India, 2009: Publication Division,Ministry of Information Broadcasting, Govt. of India
Singh, B D.(1992): *Planning for Rural Development and Poverty Alleviation*, Mittal Pub.
Menon, N and Nigom, A (2007): *Power and the Contestation: India since 1989*, Zed Books
Smith, R.W (1986*): Exclusive Economic Claims: An Analysis and Primary Documents*, Martinus Nijhoff Publisher

UNIT-26: Geography of Globalization

Appaduria, A. (2001): *Globalization*, Duke University Press
Cofman, E and Youngs, G (1996): *Globalization: Theory and Practice*, Continum International Publishing Group.
Dasgupta, Biplab (2005): *Globalization- India's Adjustment Experience*; SAGE, New Delhi.
Haggett, P. (2001): *Geography: A Global synthesis*, Prentice Hall
Mackinnon, D. and Cumbess, A. (2007): *An Introduction to Economic Geography: Globalization, Uneven development and ……*, Prentice Hall
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Vertova, G. (2006): *The changing economic geography of Globalization*, Routledge
W.Murray (2006): *Geographies of Development*, Routhledge Publication
Youngs, G. (2001): *Globalization, Communication and Technology*, Cambridge.
Goldin, I and Reinert, K (2012) : Globalization for Development, Oxford University Press, New York
Potter, R.B and Binns, Tony (Eds) (2001); Globalization and Development, Pearson Education Limited, Harlow

UNIT-27: Environmental Ethics and Regulation

Farmer, A. (1997): *Managing Environmental Pollution*, Routledge, London: 246p.
Ghosh, S.K. (2007): *Environmental Act in India*,
Joshi, A. (2008): *Global Environmental Agreements: Insight and Implication*, Eastern Book Corporation
Marsh, W.M. and Grossa, J.M. (1996): *Environmental Geography: Science, Landuse and Earth Systems*, John Wiley & Sons.
Maryk, Theodore (1996): *Major Environmental Issues Facing 21st Century*, Prentice Hall
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Roberts, N. (editor) (1994): *The Changing Global Environment*, 3rd edition, Blackwell Pub. Co., London: 531 p.
Santra, S.C. (2001): *Environmental Science*; New Central Book Agency, Kolkata.

UNIT-28: Transport Geography

Adler, H.A (1987): *Economic Appraisal of Transport Project*, John Hapkins Press. Washington.
Dasgupta, A.K. and Pearee, D.W. (1972); *Cost Benefit analysis, theory and practice*; Mac Millan, London.
Flahesly CAO (2006): *Transport Planning and Traffic Engineering*, Butterworth- Heinemann

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Lays M.G. (1993*): Wags of the World*, Primarera Press, Sydwen
Pearce D.W. and Markyanda, A. (1989*): Environmental policy Benefits*, Manetany valuation OECD ,Paris.
While, P. (1986): *Public Transport Planning*, Management and operation, Hatechinson, London.

UNIT-29: Emerging Issues and Policies on Environment

Maryk, Theodore (1996): *Major Environmental Issues Facing 21st Century*, Prentice Hall
Park, C. (1998): *The Environment: Principles and Applications*, Routledge, London:
Pickering, K. and Owen, L.A.(1997) : *An Introduction to Global Environmental Issues*, 2nd edition, Routledge, London.
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Frances Drake, (2000): *Global Warming: The Science of Climate Change*:, Arnold Pub.
Harvey Danny(1999): *Global Warming*:, Pearson Education India
Mike Gonzalez, Marianella Yanes(2015): *The Last Drop-The Politics of Water*, Pluto Press,
Wendy Nelson Espeland (2015): *The Struggle for Water: Politics, Rationality, and Identity in the American Southeast*, University of Chicago Press
Paolo F. Ricci (auth.) (2006): *Environmental and Health Risk Assessment and Management: Principles and Practices*, Springer Netherlands
Marquita K. Hill (2010): *Understanding Environmental Pollution*, Cambridge University Press
Chris Barrow (2005): *Environmental Management and Development*. Routledge
Andrew E. Collins, Jones Samantha, Bernard Manyena, Janaka Jayawickrama, (2014): Hazards, *Risks, and Disasters in Society*, Elsevier
Fred Krüger, Greg Bankoff, Terry Cannon, Benedikt Orlowski, E. Lisa F. Schipper(2015): *Cultures and Disasters: Understanding Cultural Framings in Disaster Risk* Routledge
Peter Christoff, Robyn Eckersley: *Globalization and the Environment*, ,Rowman and Littlefield ,Newyork

UNIT-30:Environmental Hazards and Disaster Management

Alexander, D. (1993): *Natural Disasters*, Research Press, New Delhi: 619p.
Baarrsches, W.H. (1996): *Eco-facts and Eco-fiction: Understanding the Environmental Debate*, Routledge, London.
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Vogler, J. (1995): *The Global Commons: A Regime Analysis*, John Wiley and Sons Ltd., Chichester: 233p.

UNIT-31: Coastal Processes

Carter, R.W.G (1988): *Coastal Environments: An Introduction to the Physical, Ecological and Cultural Systems of Coastlines*, Academic Press, London
Dayer K.R. (1979): *Estuary Hydrography, and Sedimentation*, Cambridge Univ. Press, Cambridge.
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UNIT-32: Coastal Environments:Focus on Indian Regions

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UNIT-31: Foundation of Urban Geography

Carter, H. (2002): *Urban Geography*, 4th edition Arnold-Heinemann, New Delhi: 434p.
De Blij, H.J. and Muller, P.O. (1997): *Geography: Realms Regions and Concepts*, 8th edition, John Wiley and Sons Ltd., New York: 569p.
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Tewari, V. Weinston, J. and Prakash Rao, V.L.S. (1986): *Indian Cities: Ecological Perspectives*, Concept Pub. Co., New Delhi.

UNIT-32: Contemporary Urban Issues

Ahuja,R (1999): *Social Problem in India*, Rawat, Jaypur
Carter, H. (1981): *Urban Geography*, 3rd edition Arnold-Heinemann, New Delhi: 434p.
Herbert, D. (1977): *Urban Geography- A social Perspectives*, David and charles, London
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Macionis, J.J and Parrillo, V.N (2010): Cities and Urban life, Pearson Education, New Jersey

UNIT-31: Physical Basis of Remote Sensing

Campbell, J .B. (1996): *Introduction to Remote Sensing*, 2nd edition, Taylor & Francis, London; 622p.
Cracknelll, A.P., and L.W.B.Hayes, (1991): *Introduction to Remote Sensing*, Taylor and Francis, Washington, DC.
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Sabins, F.F. (1997): *Remote Sensing: Principles and Applications*, 3rd edition, W.H. Freeman & Company, New York:

UNIT-32: Photogrammetry, Aerial Photo and Satellite Systems

American Society of Photogrammetry (ASP), (1983): *Manual Of Remote Sensing*, second edition, ASP, Fallschurch, VA,
Chaisman, N. (1992): *Exploring Geographical Information Systems*, John Wiley and Sons Inc., New York: 198p.
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UNIT-33: Map Transformation and Geodesy

Kraak, M.J. and Ormeling, F. (2004): *Cartography- Visualization of Geospatial Data*; Pearson Education, Singapore.
Maling, D.H. (1973*): Co-ordinate systems on Map Projection*; George Philip and Sons Ltd, London
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Sarkar, A. (1997): *Practical Geography: A Systematic Approach*, Orient Longman Ltd., Hyderabad:
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UNIT-34: Spatial Analysis in Geography

Clark, C.D. and Wilson, C.(1994): *Spatial Analysis of Lineaments: Computer and Geosciences*, V.20.No. 7/8,p. 1237-1258.
Cliff, A.D. and J.K.Ord (1981): Spatial Processes: Models and Applications. London, Pion Ltd.
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John, J.C.(2002):*Statistics and data nalysis in Geology*, Singapore, JohnWiley & Sons(Asia).
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Watson, G.S. (1983): *Statistics on Spheres*, New York, John Wiley & Sons

UNIT-35: Research Methodology

Compton,R.R.(1985): *Geology in the Field*, John Wiley and Sons.
Gardiner,V. and Dacombe,R.(1983):*Geomorphological Field Mannual*,George Allen and Unwin, London
Ghosh,B.N.(1982): *Scientific Methods and Social Research* ,Starling Publishers Private Ltd. New Delhi.
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UNIT-36: Research Exercise in Geography

Alvi. Z. (1995*): Statistical Geography: Methods and Applications*, Rawat Publication, New Delhi
Compton,R.R.(1985): *Geology in the Field*, John Wiley and Sons.
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Semester- IV (300 Marks)

THEORETICAL COURSES (200 Marks)

PAPER- GEO-401: SCHOOLS IN GEOGRAPHICAL THOUGHT AND CONTEMPORARY DISCOURSES IN GEOGRAPHY (Marks- 50)

Unit- 37: SCHOOLS IN GEOGRAPHICAL THOUGHT

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

37.1 The Field of Geography, Place of Geography in classification of knowledge and other disciplines, Geography as a social science, Physical and Human Geography. Linkages among the sub-disciplines of physical and human geography.
37.2 Development of Geography in 19th Century: Contribution of German, French, British and American schools of thought.
37.3 Conceptual and methodological development in 20th Century: changing paradigms, evolution of man-nature relation.
37.4 Typology of models and uses: structure component and characters.
37.5 Dualism and dichotomies in Geography: Determinism and Possibilism, Systematic and Regional, Aerial differentiation and Spatial organization.

UNIT- 38: CONTEMPORARY DISCOURSES IN GEOGRAPHY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

38.1 Pragmatism, Positivism and Quantitative revolution in geography
38.2 Development of critical social theories: Humanistic geography, Behaviouralism, Radicalism, Welfare geography, Feminist geography
38.3 Structuralism and Post-structuralism, Modernism and Postmodernism.
38.4 Concept of space: absolute, relative, material and social space, concept of 3rd space in geography, temporal geography, time-space prism
38.5 Recent trends in geography.

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PAPER- GEO- 402: LAND, WATER AND FOREST: CONFLICT & CONSERVATION AND SOCIAL & HEALTH GEOGRAPHY

(Marks-50)

UNIT-39: LAND, WATER AND FOREST: CONFLICT AND CONSERVATION

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

39.1 Land class systems, land use capability classes.
39.2 Land degradation, land conservation and land improvement.
39.3 Water assessment: water quality, water availability and scarcity of water, saline ground water in coastal areas, functions of wetlands.
39.4 Characterization diversity of rainforests and mangrove forests
39.5 Degradation and management of forest, social forestry and agro-forestry.

Unit- 40: SOCIAL AND CULTURAL GEOGRAPHY

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

40.1 Nature, scope and content of social Geography; Ethnicity, tribe, dialect, language, caste and religion.
40.2 Social structure and processes, social exclusion, geographies of social well-being with special reference to India.
40.3 Cultural Geography: Definition, scope and nature. Race ,religion, language as cultural attributes with special reference to India, North-South, social -cultural divide.
40.4 World cultural Realms, Morphology of cultural landscape (Carl O Sauer) and cultural diversity. Cities as melting pot of culture. Traditional folk culture- crisis and transformation
40.5 Cultural processes: Diffusion, acculturation, assimilation and cultural pluralism

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PAPER-GEO-403: REGIONAL DEVELOPMENT & MULTILEVEL PLANNING AND LANDSCAPE ECOLOGY & PLANNING
(Marks- 50)

Unit- 41: REGIONAL DEVELOPMENT AND MULTILEVEL PLANNING

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

41.1 Concept of planning: Levels of planning: Types of planning and regional disparities.
41.2 Basic principles and methodology of regional planning
41.3 Regional development strategies: Centralized, decentralized and multilevel planning for rural and urban areas, people's participation in planning- Panchayati Raj Institution.
41.4 Planning regions in India: Purpose and methods of delineating planning region. Demographic, social and economic disparities in India.
41.5 Concept and approach to rural development, Rural development programmes in India in different planning period.

Unit- 42: LANDSCAPE ECOLOGY AND PLANNING

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

42.1 Landscape: Definition, concept, nature, role, ecological description of landscape.
42.2 Structure of Landscape: Patches (shape, size, nature and boundary), corridors (type, network, matrix) and mosaics, habitat arrangement measuring metrices (Shanon Diversity Index and Simpson Diversity Index).
42.3 Landscape Dynamics: Energy flow, species movement, nutrient movement.
42.4 Anthropogenic Modification: Agricultural intensification, deforestation and development.
42.5 Landscape management and planning: Role of keystone species, conservation of fragmented habitats, sustainable landscape, and role of Traditional Ecological Knowledge (TEK) in conserving landscape. Role of GIS in landscape planning.

PAPER-GEO-404: SPECIAL PAPERS
(Marks- 50)

(Option-1: COASTAL MANAGEMENT)

Unit- 43: COASTAL ECOLOGY AND HAZARDS

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)

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*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

43.1 Study and management of- Sea weeds; seaweed ecosystem, artificial seaweeds.
43.2 Dune vegetation: Dune initiating and dune building types, adaptation and reproduction, plant-animal interaction in sand dune. Mangroves: physical environment and ecology.
43.3 Coastal hazards and their management: Sea level change- long and short term changes, regional and global effects on shore; Coastal erosion- causes and effects; Storm hazard- role in sediment transfer, effects on open and estuarine coast, management of storm hazard.
43.4 Techniques of monitoring coastal processes and land forms.
43.5 Coastal studies in India: Monitoring and research.

UNIT- 44: COASTAL ISSUES AND MANAGEMENT

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

44.1 Coral bleaching: Impact of Global warming, coastal eutrophication and habitat conservation (Coastal lagoons, other coastal wetlands)
44.2 Coastal tourism and environment conflicts (Beaches and barrier coasts, mangrove dominated coasts, coral coasts, environmental regulations).
44.3 Application of remote sensing and GIS techniques in coastal management (Geomorphological mapping, coastal cell circulation systems, environmental zoning approach, identification and diversity of coastal habitats)
44.4 Managing coastal change: Assessment of coastal vulnerability, ecosystem valuation of coast, integrated coastal zone management, coastal regulations); Coastal engineering: Developments in hard structure designs, developments in soft structure designs, new dredging techniques and procedures.
44.5 Coastal urbanization and population pressures, Coastal resource management.

(Option-2: URBAN GEOGRAPHY AND REGIONAL PLANNING)

Unit- 43: THEORETICAL BASES OF REGIONAL PLANNING

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

43.1 History of regional planning in India, theories of regional planning. Concept of balanced and unbalanced growth
43.2 Regional development perspectives: Colonial period (Dependency theories- Friedman, Andre Gander Frank, David Slater)
43.3 Growth Pole theories and the developing world by Perroux, Myrdal, Hirschman, and Boudiville.

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43.4 Agropolitan Development, Basic need approach (E.A.J Johnson, Dennis Rondinelli-USAID)
43.5 Regional Environmental issues in Purba and Paschim Medinipur Districts- Flood, Drought, coastal erosion, Salinization, Deprivation and related social conflicts, conflict in forest-society interface.

Unit- 44: PLANNING FOR REGIONAL DEVELOPMENT

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

44.1 Concept of developed and underdeveloped economy, Regional development, level of planning, Intra- and Inter-regional planning.
44.2 Perspectives and policies of Rural and Urban planning and development.
44.3 Role of agriculture in regional development and regional plans for agricultural development in India; linkage between agriculture and industry.
44.4 Role of industries and transport in regional development.
44.5 Geographic Information System as a tool for regional planning.

(Option-3: REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM)

Unit- 43: ADVANCED REMOTE SENSING

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

43.1 Thermal Remote Sensing: Concept, Sensors and Utility.
43.2 Microwave Remote Sensing:Concept, Comparison with optical system, advantages and disadvantages, spatial resolution, Real and Synthetic Aperture Radar, Passive Microwave Remote Sensing, Lidar.
43.3 Hyperspectral Remote Sensing: Concept, Sensors and utility.
43.4 Visual Image Processing& Digital image interpretation: Elements of Visual image interpretation, generation of thematic maps, information extraction.
43.5 Digital Image Processing: Pre-processing, Image Registration, Image geometric operations, Enhancement, Spatial filtering, Transformation, classification, data compression, spectral pattern recognition, output generation.

UNIT- 44: ADVANCED GIS AND APPLICATIONS OF REMOTE SENSING

Full Marks- 25 (End term Examination- 20 and Internal Assessment- 5)
*Pattern of setting questions: **Group- A** (Long Answer Type): Two questions, each of **8 marks** (without division), will be set for answering any one. **Group- B** (Semi-long Answer Type): Four questions, each of **4 marks** (without division), will be set for answering any two. **Group- C** (Short Answer Type): Four questions, each of **2 marks** (without division), will be set for answering any two.*

44.1 Advanced GIS: Spatial data model, Data entry, data analysis, Data models. Data sources, Data captures, attribute data management and Meta data concept.
44.2 Data Infrastructure: Spatial Data Infrastructure: NSDI.

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44.3 Modern trend in GIS: Local to Global concept in GIS, Integration of GIS and Multimedia, 3D GIS and Web GIS, Real time GIS, Mobile GIS, Collaborative GIS, concept and application of GPS and GNSS.
44.4 Integration of Remote sensing and GIS: Concept and importance of Remote Sensing and GIS integration in Geographical studies.
44.5 Applications of Remote Sensing and GIS: Landuse/land covers mapping, soil and agricultural mapping, geomorphological mapping, watershed mapping.

PRACTICAL COURSES (100 Marks)

PAPER-GEO-405: ADVANCED QUANTITATIVE METHODS AND GEOGRAPHIC INFORMATION SYSTEM
(Marks- 50)

Unit- 45: ADVANCED QUANTITATIVE METHODS

Full Marks- 25
*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

45.1 Analysis of Variance: Objectives; One-way and Two-way ANOVA.
45.2 Fitting Second Degree Polynomial curves to bivariate geographical data and testing by ANOVA.
45.3 Multiple Regression: Linear multiple regression equation, Multiple and partial correlation coefficient.
45.4 Elementary multiple regression modeling techniques: Stepwise variable entry method, Path Analysis.
45.5 Model building techniques

Unit- 46: GEOGRAPHIC INFORMATION SYSTEM

Full Marks- 25
*Pattern of Setting Questions: **Three** compulsory questions bearing marks **7, 7 and 6** respectively, will be set covering the whole unit. **5** marks will be allotted for Laboratory Note Book and Viva-voce.*

46.1 Basic Concepts and components in GIS: An overview of the development of the GIS fields, Data Sources; Data acquisition methods
46.2 Data structure: Vector and Raster data structures, data storage.
46.3 Modern trends in GIS: 3D GIS and Web GIS, Real time GIS, Mobile GIS and application of GIS
46.4 Basics of GPS Surveying: Conceptual Framework, Space Segment, Ground Segment, Control Segment, Satellite Triangulation, Pseudo Random Code. DGPS and GNSS
46.5 GPS-aided traversing; Manual and Computer plotting for preparation of maps.

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PAPER- GEO-406: SPECIAL PAPER BASED FIELD WORKS
(Marks- 50)

Evaluation will be done on Participation of the candidate in field work- 10; Report making- 15;

(Option-1: Coastal Management)

Unit- 47: FIELD WORK

Field works in Deltaic/ Non-deltaic or Rocky Coastal Environments

47.1 Studies on the shore profile forms and channel cross sections using echo-sounder and current meter. Littoral environment observation with special reference hydrological parameters: Waves, tides, winds and currents.
47.2 Coastal sediment budget analysis.
47.3 Analysis of population pressure on the coastal zones.
47.4 Analysis of coastal ecosystem diversity using remote sensing.
47.5 Hazard mapping and community vulnerability mapping Mapping CRZ violation areas using GPS handset, Nearshore geomorphological mapping with conventional surveying equipments or with Total Station. Mapping of the forms of coastline changes

Unit- 48: FIELD REPORT
Presentation of research work-25 (Grand Viva-10 and/or Power Point presentation-15)

Generation of report (within about 100 A4 size pages including 30-40 maps/diagrams/field photographs) on the basis of field works carried out under Unit-47.

Option-2: Urban Geography and Regional Planning)

Unit- 47: FIELD WORKS
Evaluation will be done on Participation of the candidate in field work- 10; Report making- 15;

Field works on focused urban issue(s) in an urban area e.g. Small town/ Big city/ Few wards of a Big City

47.1 Wardwise landuse/land cover survey using high resolution Remote Sensing data. Wardwise distribution of population and its change over time.
47.2 **Survey of** spatial distribution of urban facilities (Bank, School, College, Offices, Hospitals etc.), urban transport: Nodes, Network and flow: Collection of database (Primary and Secondary), Water supply system: waste collection and disposal system
47.3 Study of Urban sprawling, renewal, economics, environmental problems etc.: Collection of database (Primary and Secondary)
47.4 Income/Social grouping, Ethnic groups Education; Occupation; Age-sex Composition etc.
47.5 Enquiries on future prospects and planning strategies

Unit- 48: FIELD REPORT

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Presentation of research work-25 (Grand Viva-10 and/or Power Point presentation-15)

Generation of report (within about 100 A4 size pages including 30-40 maps/diagrams/field photographs) on the basis of field works carried out under Unit-47

(Option-3: Remote Sensing and Geographic Information System)

Unit- 47 (Field Works)

Evaluation will be done on Participation of the candidate in field work- 10; Report making- 15;

Field works for ground truth verification in a selected field area

47.1 Remote Sensing in Earth Sciences: Geomorphic Mapping; Visual interpretation of landforms; Basic Concepts, Recognition elements, interpretation of drainage pattern, erosion and deposition landforms.

47.2 Remote Sensing in Agricultural Applications: Soil Mapping, Crop Mapping/ Crop stress determination. Forest Management-Forest density mapping, Forest type mapping.

47.3 Remote Sensing in Land and Water Management: Landuse/ Land cover Planning, Land resource management; Water Resources: Surface water-ground water, water deciphering, quality inventory and monitoring, quality assessment; Watershed Management: Morphometric Analysis, Hydro-morphogeologic interpretation techniques for targeting ground water potential zones in alluvial, sedimentary and hard rock areas; flood assessment and watershed management.

47.4 Remote Sensing in Urban and Rural Development: Mapping of human habitation and type.

47.5 Remote Sensing in Coastal Management: Coastal Landuse, Spatial and temporal changes, SST, Phytoplankton assessment, Sediment assessment.

Unit- 48: FIELD REPORT

Presentation of research work-25 (Grand Viva-10 and/or Power Point presentation-15)

Generation of report (within about 100 A4 size pages including 30-40 maps/diagrams/field photographs) on the basis of field works carried out under Unit-47.

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UNIT-37: Schools in Geographical Thought

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Chorley, R.J. and Hagget, P. (editors) (1965): *Frontiers in Geographical Teaching*, OUP, Oxford: 231p.Delhi: 195p.

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Dunbar, G.S. (edt.) (1991): *Modern Geography: An Encyclopaedic Survey*, St. James Press, Chicago: 219p.

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Hussain, M. (1995): *Evolution of Geographical thought*, 3rd edition, Rawat Pub. Co., New Delhi: 432p.

Messy, D. and Allen, J. (editors) (1984): *Geography Matters: A Reader*, Cambridge University Press, Cambridge: 204p.

Stoddart, D.R. (1986): *On Geography and its History*, Basil Blackwell, Oxford: 236p.

UNIT-38: Contemporary Discourses in Geography

Adhikari, S. (1992): *Geographical Thought*, Chaitanya Pub. House, Allahabad: 272p.

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UNIT-39: Land, Water and Forest: Conflict and Conservation

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Yasmi Yurdi (201o): Conflict over forests and land in Asia Impacts, causes, and management, The Centre for People and Forest, RECOFTC: Website: www.recoftc.org.

UNIT-40: Social and Cultural Geography

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UNIT-41: Regional Development and Multilevel Planning

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UNIT-42: Landscape Ecology and Planning

Turner, Monica G., Gardner, Robert H., O'Neill, Robert V.:Landscape Ecology in Theory and Practice Pattern and Process,Springer
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UNIT-43: Coastal Ecology and Hazards

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UNIT-44: Coastal Issues and Management

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UNIT-43: Theoretical Bases of Regional Planning

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